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ABSTRACT

Developmental changes in preschool children's awareness of the relative effectiveness of four nonverbal strategies in a memory-for-location task were investigated. Fifty-two preschool children (12 three-year-olds, 20 four-year-olds, and 20 five-year-olds) made paired comparison judgments as to the mnemonic effectiveness of marking, touching, looking at, or ignoring the location of a hidden toy. Stimuli in the study were black and white videotapes featuring a 6-year-old model who was presented with a memory-for-location task. The task involved remembering where an object was located when it was hidden under one of six identical cups on a turntable that was subsequently slowly rotated. Following initial demonstration of the four strategies, twelve pairs of strategies were presented for paired comparison judgments. For each pair, the child was asked to point to the strategy that would help the model "remember best." All three age groups ordered the strategies identically, judging marking as most effective, followed by touching, looking, and ignoring. There was a developmental increase in the tendency to choose the more effective strategy over the less effective. Five-year-olds were significantly less likely to choose ignoring and tended to choose the marking strategy more often than the younger children. (Author/RH)

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Preschoolers' Judgments of Strategy Effectiveness: Developmental Changes in a Theory of Mind

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Preschoolers' understanding of the relative benefits of four strategic responses to a memory-for-location task was investigated. Three-, four-, and five-year-olds made paired comparison judgments as to the mnemonic effectiveness of (a) marking, (b) touching, (c) looking at, or (d) ignoring the location of a hidden toy. All three groups ordered the strategies identically, judging marking as most effective, followed by touching, looking, and ignoring. There was a developmental increase in the tendancy to choose the more effective strategy over the less effective. Five-year-olds were significantly less likely to choose ignoring and tended to choose marking strategy more often than the younger children.

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Preschoolers' Judgments of Strategy Effectiveness:

Developmental Changes in a Theory of Mind

That part of the knowledge base relevant to cognitive processes has been characterized by Wellman as one's "theory of mind." This theory includes all information, both veridical and nonveridical, as to how cognitive processes work, what variables effect them, and how relevant variables interact. Research indicates that children as young as four years of age possess a rudimentary "theory of mind." In the area of memory functioning, for example, work by Wellman and Yussen and Byrd indicates that four-year-olds are aware of the effect of several memory relevant variables, such as interference and amount of material to be remembered. More importantly, preschoolers respond to the interaction among variables. Wellman, Collins, and Glieberman, in 1979, found that amount to be remembered interacted with effort expended to determine judgments of task difficulty of four-year-olds. This study illustrated the importance of investigating the interaction of information within the knowledge system for determining metamemory judgments and memory performance. Awareness of relevant variables does not exist in isolation, but interacts with judgments as to the importance of other factors.

The current research was designed to investigate developmental changes in that part of the knowledge base relevant to memory strategies. Previous research indicates that children under approximately seven years of age are relatively insensitive to the mnemonic benefits of verbal memory strategies. Several studies, however, by Wellman and his colleagues in 1975, and more recently by Baker-Ward in 1980 and Short and Miller in 1981 suggest that preschoolers may adopt various nonverbal behaviors in response to a request to remember. In Short and Miller's study, for example, four-year-olds appeared

to adopt a strategy of "looking longer" at to-be-remembered items. These findings suggest that the strategic knowledge base of preschooler's may consist primarily of information on the usefulness of nonverbal memory strategies.

Based on this, the current study examined developmetal changes in awareness of the relative effectiveness of four nonverbal strategies in a memory-for-location task. These strategies varied in their effectiveness for increasing performance on the task and it was hypothesized that the child's current theory of mind would be reflected in judgments as to the benefits of each strategy. Developmental changes were expected to result in clearer discrimination among the strategies on the basis of effectiveness.

The subjects in the study were 52 preschool children, 12 three-year-olds, 20 four-year-olds, and 20 five-year-olds. Each child was tested individually. Stimuli in the study were black and white videotapes featuring a six-year-old model. The videotape showed the model being presented with a memory-for-location task. This task involved remembering where a hidden object, a miniature Cookie Monster doll, was located when it was hidden under one of six identical cups on a turntable and the turntable was slowly rotated. Four responses to the task, varying in their effectiveness for increasing location recall, were then demonstrated by the model. The strategies demonstrated were (a) marking: using a colored token to identify the correct cup, (b) touching: holding one's finger on the correct cup, (c) looking: visually focusing on the correct cup, and (d) ignoring: looking away from the stimulus array during rotation. Following initial demonstration of the strategies, 12 pairs of strategies were presented for paired comparison judgments representing all possible permutations of the four strategies. Each pair consisted of 15 second demonstration segments of two of the strategies. The experimenter provided labels for each strategy and still pictures of the strategy pairs

were also presented to minimize memory demands. For each pair, the child was asked to point to the strategy that would help the model "remember best." Two stimulus orders were used with half the children at each age level receiving each order.

The paired comparison data were initially examined to determine whether the children could effectively make the paired comparison judgments. Since each pair of strategies was presented twice, counterbalanced for position, a measure of consistency was provided based on whether the child chose the same strategy as most effective on both presentations. Although degree of consistency varied over the six pairs involved, on the average 64% of the 3-year-olds, 58% of the 4-year-olds, and 77% of the 5-year-olds chose the same strategy on both presentations. This was above chance consistency only for the 5-year-olds.

In the paired comparisons paradigm lack of consistent judgments may result from either of two conditions. First, the subject may simply fail to understand the task requirements and respond randomly. Alternatively, the subject may understand the task but not discriminate between the stimuli on the basis of the attribute being judged. That is, in this case, they may feel the strategies are equally effective for memory recall. In the current study the second explanation is supported by the finding that consistency was greater when the ignoring strategy was paired with any of the other three strategies. Pairs including the ignoring strategy were judged consistently by 69%, 65%, and 65% of the 3-, 4-, and 5-year-olds, respectively. All of these proportions were significantly above chance. Comparisons among the other three strategies were less consistently judged, 58%, 52%, and 52% by the 3-, 4-, and 5-year-olds, indicating less discrimination among these strategies on the

basis of effectiveness. These data were felt to exhibit sufficient consistency to warrant further analysis.

A paired comparison analyses was conducted on the proportion of times each strategy was chosen over every other strategy by children at each age level. These analyses yielded scale values reflecting the order of the judged strategies along a psychological continuum of effectiveness in the task. That is, the analysis indicated the strategy judged most effective, second most effective, and so on, at each age level. Results indicated that all three age groups ordered the four strategies identically as to their effectiveness in the task. This consistent ordering and the scale values are shown in Table 1. Marking was chosen as the most effective strategy, followed by touching, looking, and ignoring. Although all three groups ordered the strategies in the same way, however, the magnitude of the scale values differed markedly across age. Tests for significant differences among the scale values indicated that the three-year-olds judged the touching and marking strategies to be significantly more effective than the ignoring strategy. The four-year-olds judged the marking strategy to be significantly more effective than both the ignoring and looking strategies. The five-year-olds judged the looking, touching, and marking strategies as significantly more effective than ignoring. These results indicate that children as young as three years were aware that ignoring was not an effective strategy in this task and that marking was the most effective mnemonic. On the other hand, the children did not usually discriminate among the looking, touching, and marking strategies on the basis of effectiveness. The only significant difference among these strategies was that the kindergartners judged the marking strategy as significantly more effective than looking. Thus, although preschool children ordered the strategies as to

effectiveness, it might be expected that older children would discriminate more clearly among the three more effective strategies.

Examination of the data for developmental changes indicated a significant increase with age in the probability of choosing the more effective strategy over the less effective on any paired comparison trial. The more effective strategy was chosen on 65%, 61%, and 76% of the paired comparison trials by the three-, four-, and five-year-olds, respectively. Age changes in the probability of choosing each of the strategies were also examined. One-way analyses of variance were conducted on the proportion of trials in which a strategy appeared that it was chosen by the children at each age level. Results indicated that the five-year-olds were significantly less likely than the three- and four-year-olds to choose the ignoring strategy. There were no developmental differences in the frequency with which the looking and touching strategies were chosen, however, the five-year-olds tended to choose the marking strategy more often than the younger children ($p < .09$).

The results of this study have two important implications for future research. First, they indicate that preschool children can discriminate among nonverbal behaviors on the basis of strategic effectiveness. Even the youngest children were aware that marking was a significantly more effective strategy than ignoring and with age discrimination among the strategies increased. This is in contrast to earlier findings which indicated that preschoolers were virtually unaware of the benefits of verbal strategies. Thus, it appears that early developmental changes in the knowledge base concerning memory strategies may involve integration of information regarding the relative effectiveness of nonverbal behaviors.

Second, the results of this study illustrate the importance of investigating the relationship among items of information within the knowledge system.

Developmental changes in the child's theory of mind may not necessarily depend on the acquisition of new information about memory. Rather, continuous integration and organization of information may result in increased awareness of memory functioning. Initially, separate items may become integrated into a network of information regarding behaviors appropriate for various memory tasks.

This study represents an initial attempt to describe a system of knowledge underlying the metamemory judgments of preschool children. It provides evidence of developmental changes in the knowledge system. However, only a small fraction of the child's information about memory was examined. It might be expected that the network of information regarding memory strategies would also be effected by stored information on what strategies are appropriate for specific tasks (task variables) and what strategies can be expected most efficiently (person variables). Further research is necessary to delineate the complex system of knowledge influencing metamemory judgments and memory behavior.

Table 1

Order of Preference and Scale Values of Judged Memory Strategies at Each Age Level

Age	Strategy			
	Ignoring	Looking	Touching	Marking
Three-year-olds:				
Order of Preference	4	3	2	1
Scale Values	.000	.491	.650*	.979*
Four-year-olds:				
Order of Preference	4	3	2	1
Scale Values	.000	.160	.323	.664**
Five-year-olds:				
Order of Preference	4	3	2	1
Scale Values	.000	1.23*	1.43*	2.07*

* Judged significantly more effective than ignoring.

** Judged significantly more effective than looking.